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CHAMIER

ON

AUSTRALIAN TIMBER.

AUSTRALIAN TIMBER.

BY

GEORGE CHAMIER, M. INST. C.E.

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THE INSTITUTION OF CIVIL ENGINEERS.

SECT. II.—OTHER SELECTED PAPERS.

(*Paper No. 2185.*)

"Australian Timber."

By GEORGE CHAMIER, M. Inst. C.E.

WHILE the use of timber for docks and marine works, except for temporary structures, is almost obsolete in Great Britain, it still maintains an important place in the Colonies of Australia, where it is largely employed for engineering works.

This is mainly due to the excellence of many of the native hard woods as regards strength and durability, and to the small cost of timber compared to that of masonry, or even concrete.

It is not that in Australia, as in many parts of North America, good timber is either plentiful, or very cheap. The reverse is the case. On this great southern continent timber is comparatively scarce. There are, indeed, extensive areas of forests in certain localities, but they are for the greater part situated far inland, or in places difficult of access, so that the expense of carriage adds largely to the cost of timber for marine works. Even for bridge-building, it has often been found more economical to use iron at the high price paid for the imported article, than to employ timber obtainable in the country. For, in addition to the high rates charged for the native material, the cost of working these timbers is exceptionally great on account of their weight and extreme hardness. Notwithstanding these disadvantages, yet for wharves, jetties, wet docks, and other marine works, the use of timber is almost universal in Australia, and it is only in very exceptional circumstances that colonial engineers have departed from a practice which possesses decided advantages, and which has hitherto been attended with satisfactory results.

Seeing, then, their importance the Author will furnish a few brief particulars about timbers most in use in Australia, and which are best fitted for engineering works.

The Jarrah (*Eucalyptus marginata*) takes the foremost place for durability in exposed and marine situations. This well known timber is found in Western Australia, where it grows in huge forests that stretch parallel to the coast, at distances from it of 15 to 30 miles. The Jarrah has a straight stem from 40 to 80 feet to the first branch, and ranging from 2 feet to 8 feet in diameter. It grows to perfection on elevated ironstone ranges, which are almost denuded of soil, and where hardly any other vegetation can exist. The best timber is found on the poorest ground, and the trees that grow on low-lying lands are of a very inferior description. Jarrah wood is of a dark red colour, and, as a rule, the darker shades indicate the best timber. It is hard, close-grained, fibrous, and resinous; secreting a highly pungent acid, which is supposed to give its peculiar immunity against the attacks of worms and insects. The wood works well, and takes a good polish, and it is utilized to some extent for furniture and ornamental purposes. Jarrah is considered to be almost indestructible; its lasting qualities have indeed been established beyond doubt, but the claim put forward on its behalf that it is proof against the ravages of the white ant, and the *teredo navalis*, under all circumstances, cannot be sustained. It may be admitted that in most places on the Australian coast, and in many parts of that Continent, Jarrah has resisted the attacks of these pests. Numerous instances have been recorded of Jarrah piles having been exposed in trying positions for periods of more than thirty years, without showing indications of decay. It has also been established that in many localities, where other timbers have been completely riddled by the sea-worm in a very short space of time, Jarrah has remained uninjured.

But, on the other hand, there are many well authenticated instances of Jarrah wood having been destroyed by the white ant, and by the still more dreaded *teredo*, especially in tropical climates. It has been suggested that in these cases of failure the wood may have been of inferior description obtained from swampy ground; or that the trees may have been felled at the wrong time of year—a very common occurrence—or that the timber may have been improperly seasoned, which is rather the rule than the exception. No doubt much of the Jarrah that has perished would come under these categories. But unfortunately there are good reasons for believing that even the best samples of the timber are not proof against failure in all localities. It may, however, be accepted that the *teredo navalis* will not burrow into Jarrah wherever anything more palatable is to be found. It is only in extreme cases that Jarrah is attacked. The question involved is an important one; and it appears to the Author that it can only be decided by experiment. There is no general rule for guidance. In places where it is proposed to use timber for maritime works, the only safe method would be to fix a few piles for observation. It could then be easily ascertained whether the timber could stand the test. The results lately obtained in the northern territory of South Australia have not been favourable, and consequently the Railway Department of that Colony has recently decided to use steel sleepers in lieu of Jarrah, for the Palmerston and Pine Creek Railway, and also to sheathe in copper the timber piles for the new railway jetty at Palmerston. In all other respects, however, the durability of this valuable timber has been fully established. Indeed, the experience of the Australian Colonies has not yet been sufficient to determine, with any degree of certainty, the average life of Jarrah piles in exposed situations; but under ordinary circumstances, it might safely be taken at thirty years.

In common with several other species of gum tree Jarrah is much given, at maturity, to decay at the centre. Trees apparently sound, and from which much sound timber can be obtained, are yet frequently found rotten at the core. This renders it often difficult to obtain large scantlings from big trees, as the heart-wood has to be avoided. The timber is also rather deficient in strength and tenacity, as compared with other members of the eucalyptus family. The wood is brittle, subject to shakes and gum veins, and very liable to split at the ends. Thus fresh-cut logs should be carefully protected from the sun—a precaution often neglected, to the great detriment to the timber exported.

In 1870, the Author accompanied the late Mr. W. T. Doyne, M. Inst. C.E., on an official visit to Western Australia, for the purpose of reporting on proposed harbour improvements, and the opportunity was taken to inspect some of the magnificent forests of Jarrah which abound in that colony. A considerable portion of Mr. Doyne's report was devoted to an investigation of the timber trade, and a scheme was elaborated for providing greater facilities for export, and for the development of a great natural resource. Mr. Doyne expressed an opinion that under proper management and government control "an enormous profitable export trade, such as there is no parallel for in the Australian Colonies, except gold, will be created in a few years." The Government of the Colony, however, took no action beyond offering liberal concessions to private enterprise; and consequently the timber trade in Jarrah, although it has made considerable advance during the past ten years, has not risen to the proportions contemplated by Mr. Doyne, and to which, under a government system of direction, it might probably have attained. At present, several timber companies are carrying on business in Western Australia. The export in Jarrah is considerable, and the demand is generally in advance of the supply. The timber is extensively used in eastern Australia for railway sleepers and for wharf construction. It is to be regretted, however, that no proper system is adopted for felling the trees at the right season, or for seasoning the timber. The neglect of these needful precautions contributed mainly in the past to the unfavourable results of the export trade, and to the poor estimation in which Jarrah has been held in other countries.

The following are current rates at which Jarrah is being supplied :—

	Per lineal foot.	
Round piles, up to 45 feet in length, 12 inches in diameter at the small end, f. o. b. at Western Australian ports . .	2	3
At Port Adelaide or Melbourne	3	3
Round piles, in long lengths up to 60 feet, f. o. b. Western Australia	3	0
At Port Adelaide or Melbourne	4	0
	Per cubic foot.	
Squared timber, in large scantlings, f. o. b. Western Australia	2	6
Delivered at Port Adelaide or Melbourne	3	6
Sawn timber, small sizes, up to 30 feet, f. o. b. Western Australia	2	0
Delivered at Port Adelaide or Melbourne	2	9

The timber could probably be delivered in England at about 20 per cent. above the prices quoted for delivery at Melbourne.

Jarrah, when seasoned, weighs on an average from 63 to 64 lbs. per cubic foot.[1] Its transverse strength varies from 500 to 650 lbs. per square inch.[2] The crushing-strain is about 3 tons on the square inch.

The Karri (*Eucalyptus diversicolor*) is also a native of Western Australia, where it is abundant. It is a gigantic tree, reaching to heights of from 300 to 400 feet. Karri wood is very similar to Jarrah, but of a lighter colour; it is hard, heavy, straight in the grain, and very tough. The timber has great transverse strength, and it is well adapted for massive structures, as it can be obtained in enormous sizes. It is in great request for piles and for heavy scantlings. Although much superior to Jarrah in strength, yet Karri has not the same durability in damp situations; but it is said to last well under water. Its capabilities of resisting the attacks of the *teredo* have been questioned; there are, however, several instances on record of Karri logs and piles having lasted for a great many years in sea-water. The timber has a tendency to split at the ends under exposure, and it has the defect of "star-shake" to a marked extent. It is, therefore, mainly utilized in large scantlings. It is supplied in considerable quantities from Western Australia, at about the same prices that obtain for Jarrah. The weight and specific gravity of Karri are nearly the same as Jarrah. The transverse strength is 650 to 850 lbs. per square inch, and the crushing-strain is 5 tons on the square inch.

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[1] This is the standard weight, generally taken; but in the results published by the Victorian Railway Department (Official Report of Carriage Timber Board), the average weight of a cubic foot of Jarrah is given as 54·36 lbs., the average specific gravity as 0·870.

[2] The transverse strength indicates the breaking-weight, applied at the middle of a bar 1 inch square and 1 foot between supports. Here again the published results of different tests show very considerable variations.

The Red Gum (*Eucalyptus rostrata*) is indigenous to nearly all the Australian Colonies, and affords one of the most useful and durable of timbers. The tree is abundant in Victoria, where it is largely used for underground or water works, and for railway sleepers. The Red Gum is a remarkable tree, growing to heights of 80 feet to 120 feet, and 3 feet to 8 feet in diameter. It thrives in low-lying districts, and by the banks of water channels, where the soil is deep and moist. Rugged and gnarled, with huge, outstretching and twisted branches, it forms one of the grandest objects in Australian forest scenery. Red Gum, like Jarrah, is generally considered free from the liability to the attacks of the white ant and *teredo*, but no absolute reliance can be placed on this. Gifted with much the same characteristics as Jarrah, the question of the comparative merits of Red Gum *v.* Jarrah has frequently been publicly discussed. If preference is given to Jarrah for durability, it must be admitted that Red Gum is superior in strength and in toughness. It is therefore better adapted for beams and girders; but in specifications for maritime works, it is usual to couple Red Gum with Jarrah, it being left optional with the contractor to supply either timber. The wood is dark red; knotty, curly grained, rough, hard, and heavy. The weight of a cubic foot ranges from 53 lbs. to 63 lbs. The transverse strength varies from 650 to 720 lbs. per square inch.

Iron Bark (*Eucalyptus siderophloia*).—Several kinds of trees are locally termed "Iron Bark," although they belong to different species. That in the text, however, is the one generally known to commerce, and most extensively used in construction. The Iron Bark tree is principally found in New South Wales and in Queensland, where it is plentiful. It reaches to a height of 150 feet, with a diameter of 4 feet. The tree is of very slow growth. Iron Bark timber is one of the hardest and strongest in existence; its transverse strength is about half that of wrought-iron, and consequently it is unequalled for beams and girders. It has also been largely used for piles, although its durability between wind and water is not on a par with Jarrah or Red Gum. Notwithstanding its hardness, the wood is readily attacked by the *teredo navalis*, and therefore its use is not to be recommended for structures in the sea. The wood is dark red, with a close, straight grain, heavy and extremely tough. The timber is usually very solid, but, like nearly all hard woods of this genus, it is largely affected with star-shake. It stands in the first class on Lloyd's list of shipbuilding timbers, by the side of teak and greenheart. For engineering works the timber is particularly suitable where great strength and rigidity are required. The average weight of a cubic foot of Iron Bark is 72 lbs., the transverse strength 950 to 1,050 lbs., and the crushing-strain about 5 tons on the square inch.

In New South Wales this timber is almost exclusively used for engineering and marine works, there being a large local demand for it. The following are current rates at Sydney:—

	Per lineal foot.	
Round piles, up to 45 feet in length, 12 inches in diameter at small end f. o. b.	1	3
Ditto, to 60 feet in length	1	5
	Per cubic foot.	
Squared timber, to 40 feet in length	2	0
Sawn timber, smaller sizes	2	3

Blue Gum (*Eucalyptus globulus*).—A world-wide reputation attaches to this tree, on account of its health-giving qualities, and the property it possesses of drying up marshes, and counteracting miasmatic influences. It is also remarkable as being one of the fastest growing trees in the world. In favourable situations the Blue Gum reaches to heights of 400 feet, and 100 feet in circumference.

The tree is abundant in Victoria and in Tasmania, and it yields a useful timber, which is largely employed for engineering works, and for general building purposes; but it is not suitable for piles nor for underground work, nor can it be relied on to resist the white ant.

The wood is of a yellowish colour, hard and tough, and very heavy, with a curly grain. It is very durable in open and dry situations, and is much used for beams, joists, and planking above ground. The most objectionable feature about the timber is its tendency to shrink and warp under exposure to the sun. This serious defect might undoubtedly be greatly mitigated, if not removed, by the exercise of proper care in seasoning. Unfortunately, in the Australian timber trade, such precautions are but rarely taken, and it is not unusual for fresh-cut timber to be immediately utilized without any seasoning, and regardless of consequences.

The weight of Blue Gum varies from 63 lbs. to 71 lbs. per cubic foot. Its transverse strength is 550 lbs. to 850 lbs., and the crushing-strain 3 tons, to the square inch.

Sugar Gum (*Eucalyptus corynocalyx*) is indigenous to South Australia, where it is found in some of the few forests that still exist in that Colony—the country having to a large extent been denuded of timber. Under the present management of the Forest Department of South Australia, a systematic effort is being made to conserve forest grounds, and to extend the planting of trees, among which the Sugar Gum holds an important place. It reaches to heights of 80 feet to 130 feet, and yields a hard, heavy, and durable timber. It has recently been used for railway sleepers in South Australia. Its weight and strength are about the same as of Blue Gum.

Stringy Bark (*Eucalyptus obliqua*), also called Messmate, is a large tree, yielding a timber which is extensively used for house-carpentry, flooring-boards, joists, scantlings, and also for fencing. It is generally known under the popular appellation of "hardwood." There are numerous varieties of Stringy Bark, representing distinct botanical species. The Tasmanian Stringy Bark (*Eucalyptus gigantea*) is an immense tree, from which the well known Van Diemen's Land palings are obtained. The Stringy Bark of New South Wales (*Eucalyptus capitellata*) is abundant in the forests of that Colony, and in some places is said to attain to a height of 400 feet. The timber from these trees furnishes the great bulk of the hardwood used for ordinary building and economic purposes, and it is occasionally employed for the superstructure of engineering works. The wood, however, is inferior, both as regards strength and durability, to all of the foregoing. It is mostly of a light brown colour, hard, heavy, and straight in the grain. The weight of a cubic foot of this timber is about 58 lbs., and the transverse-strength 450 to 600 lbs. per square inch.

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